read the CPU ID from the hardwired input ports (4 bits, 0-15)

1

_FirstScan
SP0

LD
Kf

AND
CPU/Prog Code
VX0

OUT
CPU identification
CPU ID
V2000

Read the software revision number from the hardwired input (4 bits, 0-15)

2

_FirstScan
SP0

LD
Kf0

AND
CPU/Prog Code
VX0

SHFR
K4

OUT
software revision number
Prog Rev #
V2001

STOP if we are not using the correct CPU ID #

3

_FirstScan
SP0

CPU identification
CPU ID
V2000

K7

STOP

STOP if we are not using the correct Program Revision Number

4

_FirstScan
SP0

software revision number
Prog Rev #
V2001

K1

STOP

mask
35 Hz is full flow, OFF at 13 Hz, ON at 22 Hz, (2000-12-18)

5

mask 1 water flow NO
contact
flow1 NO
X10

mask 1 water flow NC
contact
flow1 NC
X11

mask water flow OK
mask flow 1 OK
C10
OUT

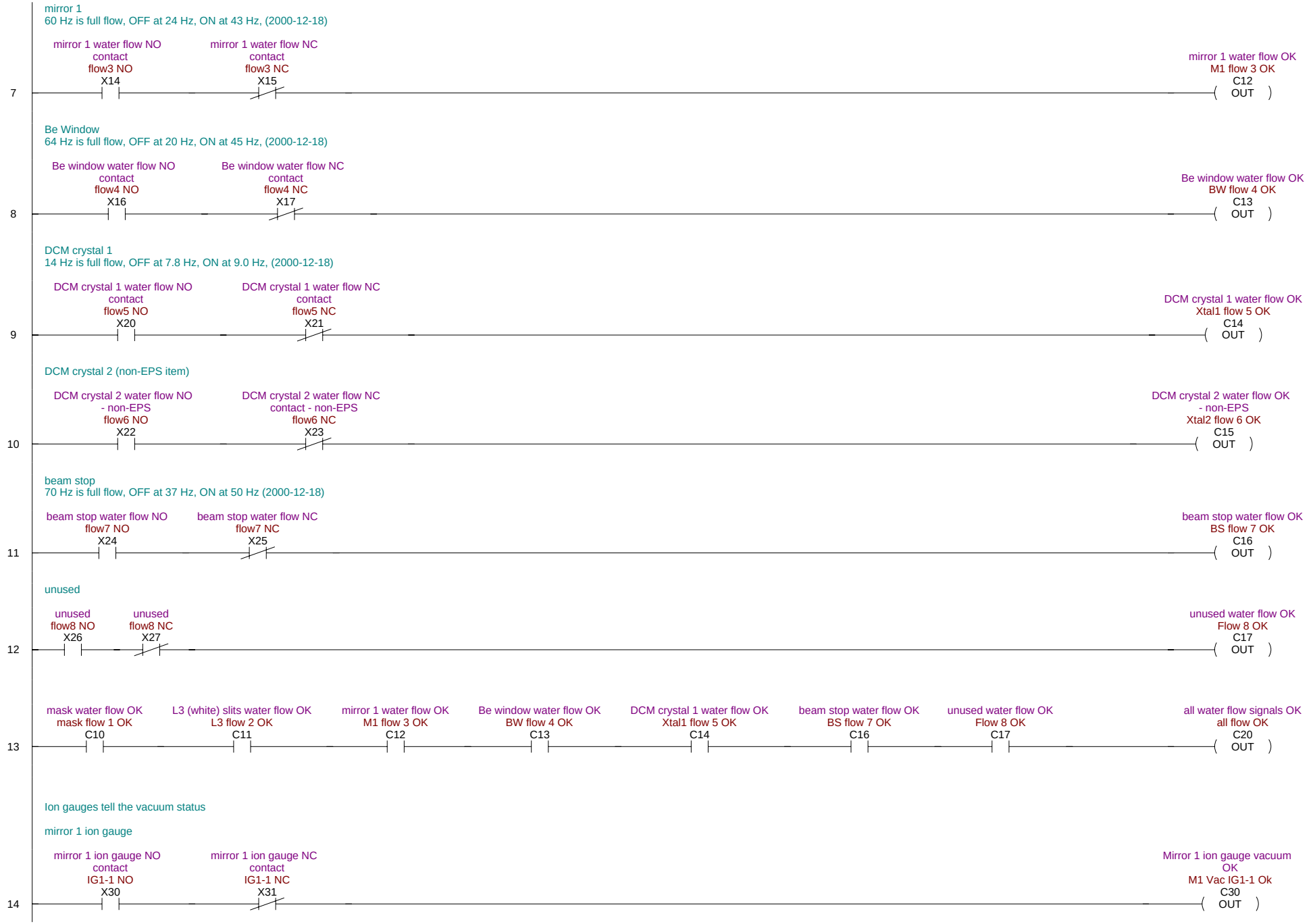
L3 (white) slits
30 Hz is full flow, OFF at 13 Hz, ON at 20 Hz, (2000-12-18)

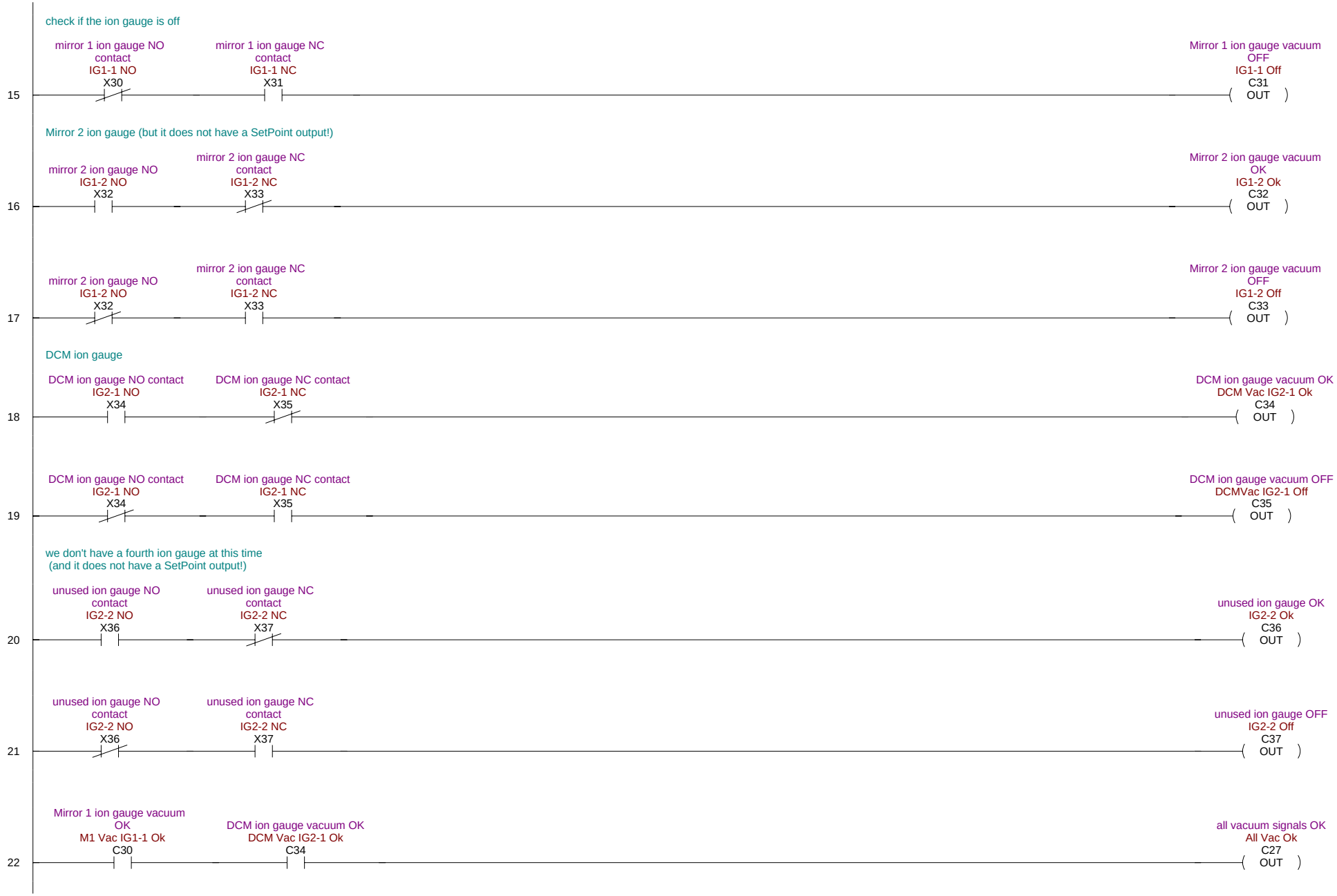
6

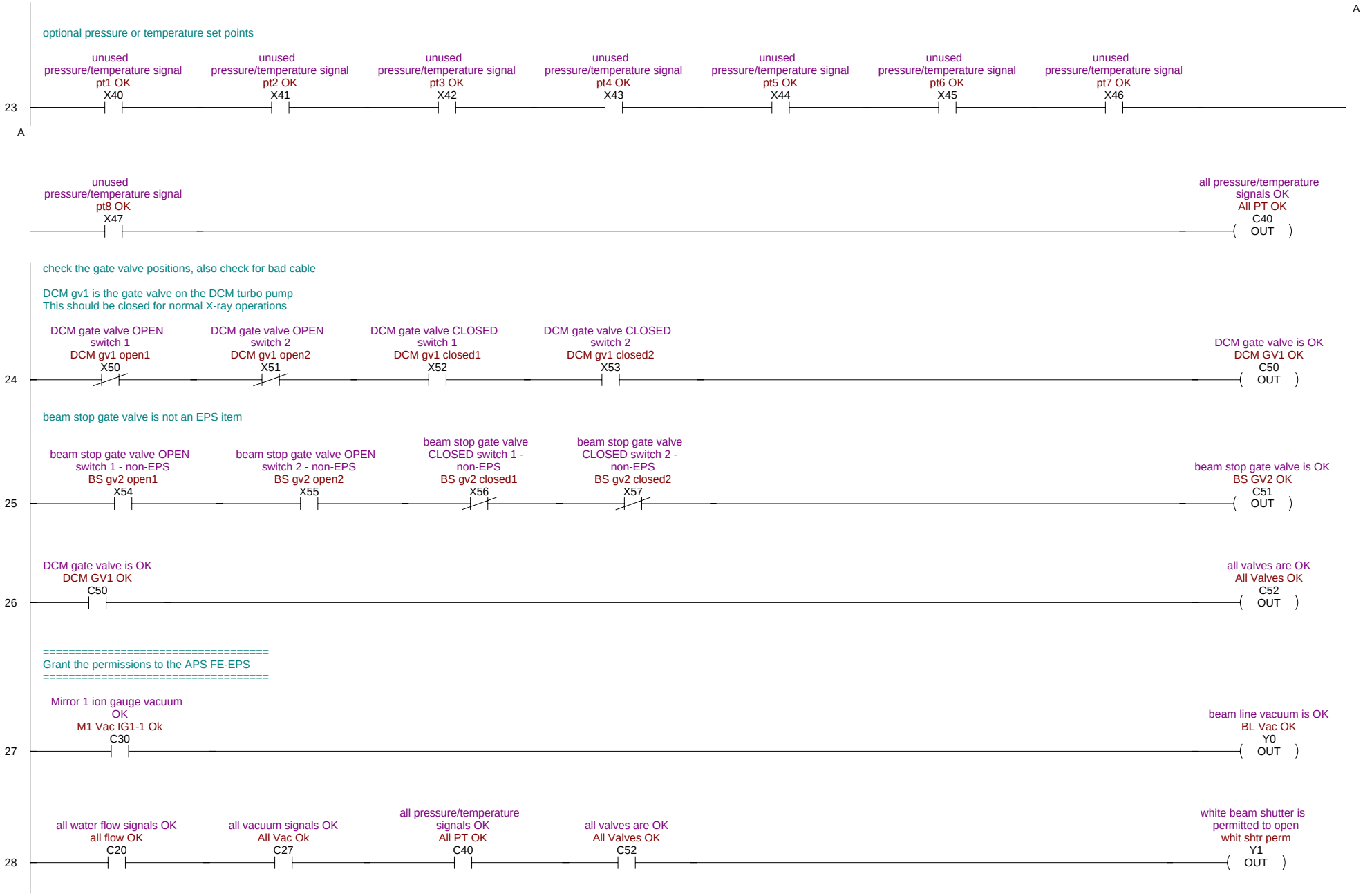
L3 (white) slits water flow NO
contact
flow2 NO
X12

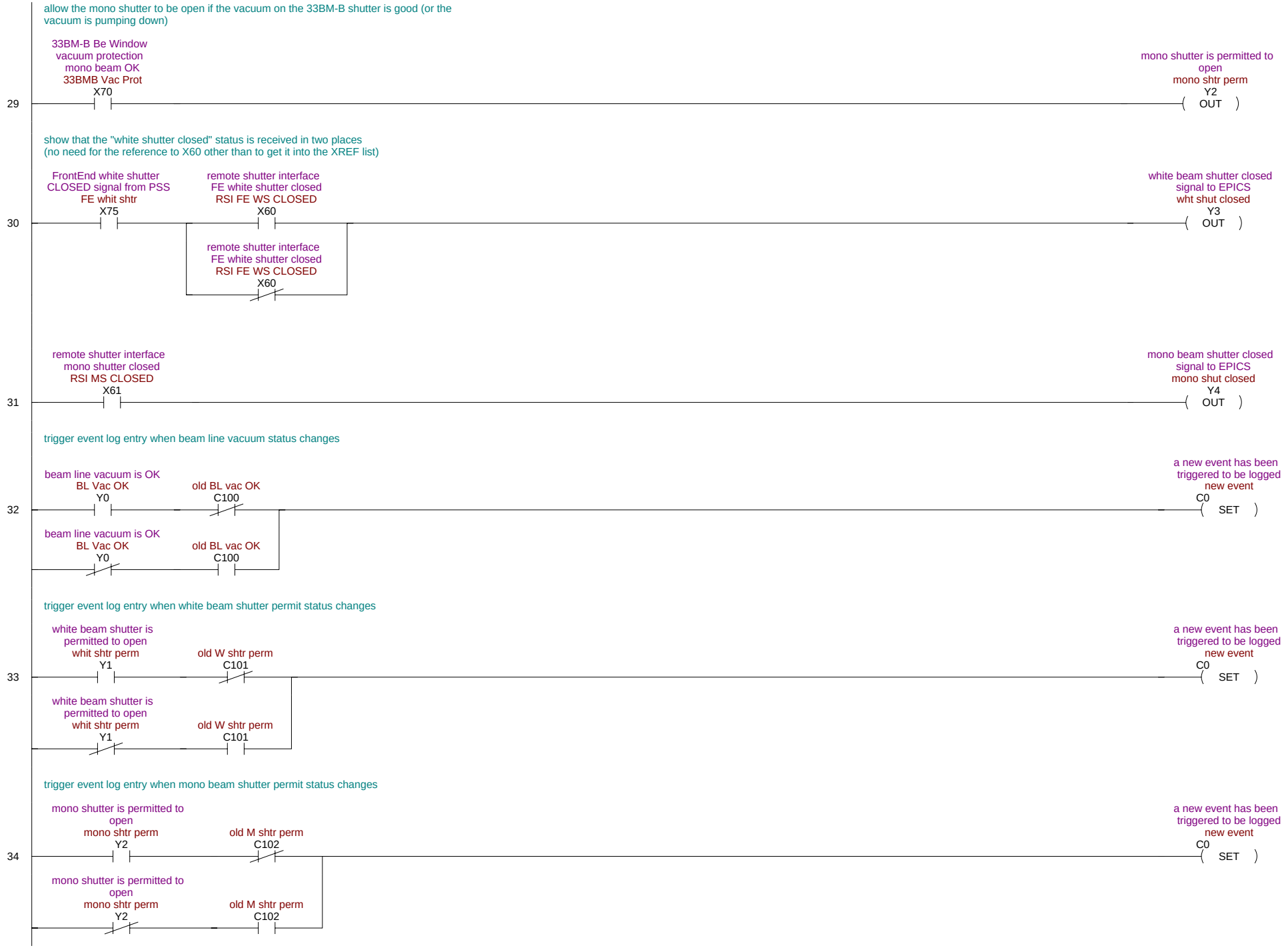
L3 (white) slits water flow NC
contact
flow2 NC
X13

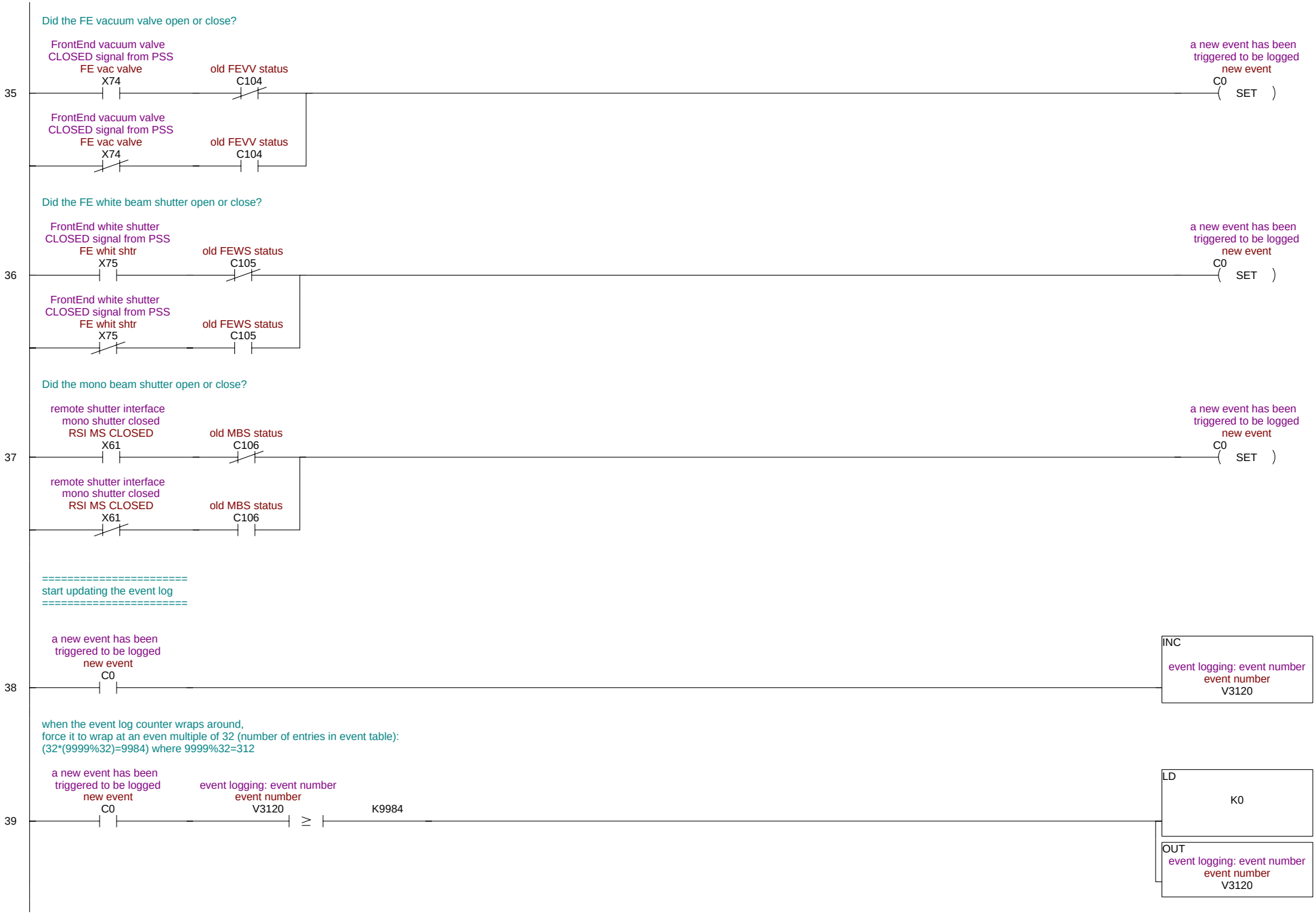
L3 (white) slits water flow OK
L3 flow 2 OK
C11
OUT


mirror 1
60 Hz is full flow, OFF at 24 Hz, ON at 43 Hz, (2000-12-18)
mirror 1 water flow NO contact flow3 NO X14
mirror 1 water flow NC contact flow3 NC X15
mirror 1 water flow OK M1 flow 3 OK C12 OUT
7
Be Window
64 Hz is full flow, OFF at 20 Hz, ON at 45 Hz, (2000-12-18)
Be window water flow NO contact flow4 NO X16
Be window water flow NC contact flow4 NC X17
Be window water flow OK BW flow 4 OK C13 OUT
8
DCM crystal 1
14 Hz is full flow, OFF at 7.8 Hz, ON at 9.0 Hz, (2000-12-18)
DCM crystal 1 water flow NO contact flow5 NO X20
DCM crystal 1 water flow NC contact flow5 NC X21
DCM crystal 1 water flow OK Xtal1 flow 5 OK C14 OUT
9
DCM crystal 2 (non-EPS item)
DCM crystal 2 water flow NO - non-EPS flow6 NO X22
DCM crystal 2 water flow NC contact - non-EPS flow6 NC X23
DCM crystal 2 water flow OK - non-EPS Xtal2 flow 6 OK C15 OUT
10
beam stop
70 Hz is full flow, OFF at 37 Hz, ON at 50 Hz (2000-12-18)
beam stop water flow NO flow7 NO X24
beam stop water flow NC flow7 NC X25
beam stop water flow OK BS flow 7 OK C16 OUT
11
unused
unused flow8 NO X26
unused flow8 NC X27
unused water flow OK Flow 8 OK C17 OUT
12
mask water flow OK mask flow 1 OK C10
L3 (white) slits water flow OK L3 flow 2 OK C11
mirror 1 water flow OK M1 flow 3 OK C12
Be window water flow OK BW flow 4 OK C13
DCM crystal 1 water flow OK Xtal1 flow 5 OK C14
beam stop water flow OK BS flow 7 OK C16
unused water flow OK Flow 8 OK C17
all water flow signals OK all flow OK C20 OUT
13
Ion gauges tell the vacuum status
mirror 1 ion gauge
mirror 1 ion gauge NO contact IG1-1 NO X30
mirror 1 ion gauge NC contact IG1-1 NC X31
Mirror 1 ion gauge vacuum OK M1 Vac IG1-1 Ok C30 OUT
14

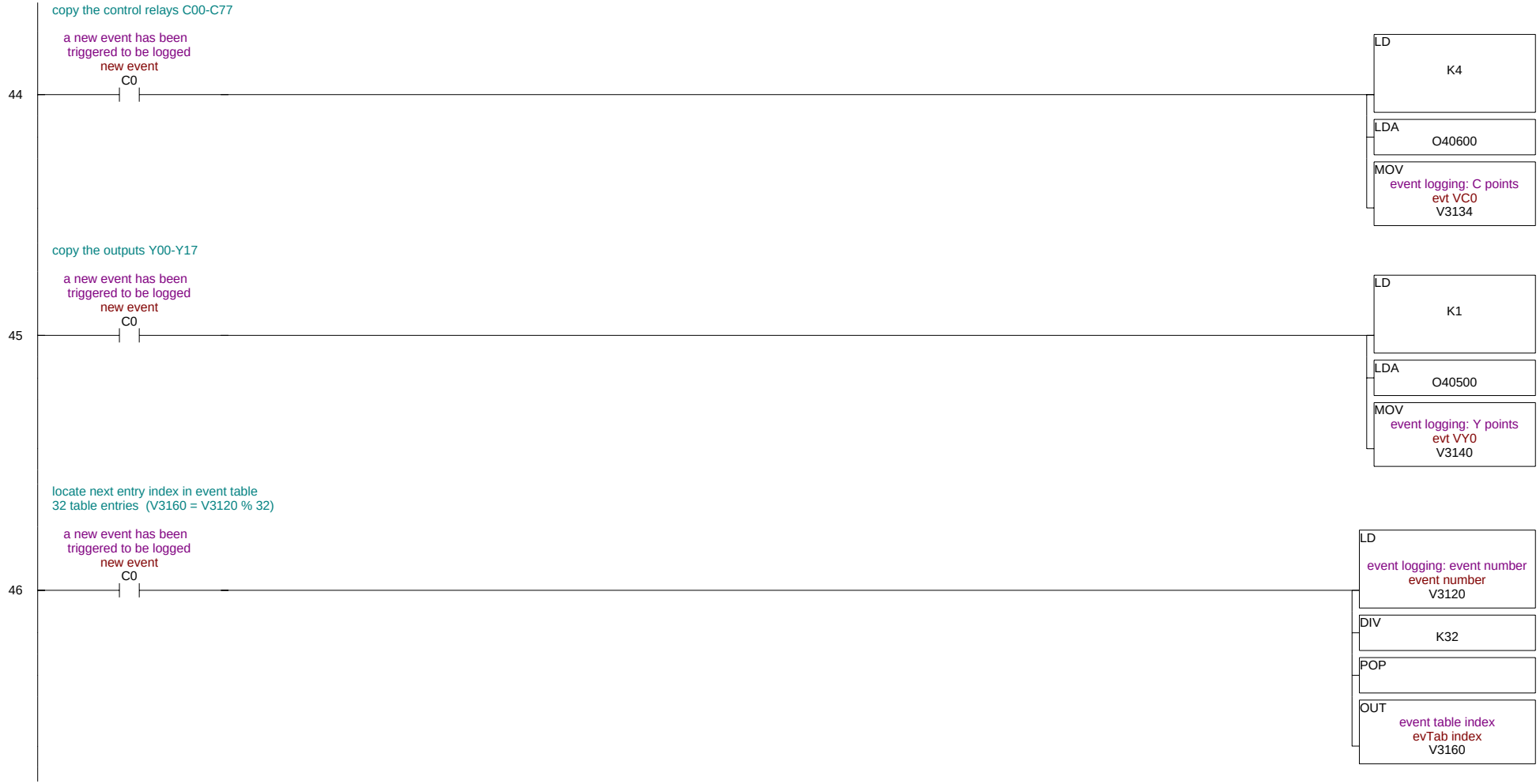

check if the ion gauge is off
mirror 1 ion gauge NO contact IG1-1 NO X30
mirror 1 ion gauge NC contact IG1-1 NC X31
Mirror 1 ion gauge vacuum OFF IG1-1 Off C31 OUT
15
Mirror 2 ion gauge (but it does not have a SetPoint output!)
mirror 2 ion gauge NO IG1-2 NO X32
mirror 2 ion gauge NC contact IG1-2 NC X33
Mirror 2 ion gauge vacuum OK IG1-2 Ok C32 OUT
16
mirror 2 ion gauge NO IG1-2 NO X32
mirror 2 ion gauge NC contact IG1-2 NC X33
Mirror 2 ion gauge vacuum OFF IG1-2 Off C33 OUT
17
DCM ion gauge
DCM ion gauge NO contact IG2-1 NO X34
DCM ion gauge NC contact IG2-1 NC X35
DCM ion gauge vacuum OK DCM Vac IG2-1 Ok C34 OUT
18
DCM ion gauge NO contact IG2-1 NO X34
DCM ion gauge NC contact IG2-1 NC X35
DCM ion gauge vacuum OFF DCMVac IG2-1 Off C35 OUT
19
we don't have a fourth ion gauge at this time
(and it does not have a SetPoint output!)
unused ion gauge NO contact IG2-2 NO X36
unused ion gauge NC contact IG2-2 NC X37
unused ion gauge OK IG2-2 Ok C36 OUT
20
unused ion gauge NO contact IG2-2 NO X36
unused ion gauge NC contact IG2-2 NC X37
unused ion gauge OFF IG2-2 Off C37 OUT
21
Mirror 1 ion gauge vacuum OK M1 Vac IG1-1 Ok C30
DCM ion gauge vacuum OK DCM Vac IG2-1 Ok C34
all vacuum signals OK All Vac Ok C27 OUT
22


A
optional pressure or temperature set points
unused pressure/temperature signal pt1 OK X40
unused pressure/temperature signal pt2 OK X41
unused pressure/temperature signal pt3 OK X42
unused pressure/temperature signal pt4 OK X43
unused pressure/temperature signal pt5 OK X44
unused pressure/temperature signal pt6 OK X45
unused pressure/temperature signal pt7 OK X46
23
A
unused pressure/temperature signal pt8 OK X47
all pressure/temperature signals OK All PT OK C40 OUT
check the gate valve positions, also check for bad cable
DCM gv1 is the gate valve on the DCM turbo pump
This should be closed for normal X-ray operations
DCM gate valve OPEN switch 1 DCM gv1 open1 X50
DCM gate valve OPEN switch 2 DCM gv1 open2 X51
DCM gate valve CLOSED switch 1 DCM gv1 closed1 X52
DCM gate valve CLOSED switch 2 DCM gv1 closed2 X53
DCM gate valve is OK DCM GV1 OK C50 OUT
24
beam stop gate valve is not an EPS item
beam stop gate valve OPEN switch 1 - non-EPS BS gv2 open1 X54
beam stop gate valve OPEN switch 2 - non-EPS BS gv2 open2 X55
beam stop gate valve CLOSED switch 1 - non-EPS BS gv2 closed1 X56
beam stop gate valve CLOSED switch 2 - non-EPS BS gv2 closed2 X57
beam stop gate valve is OK BS GV2 OK C51 OUT
25
DCM gate valve is OK DCM GV1 OK C50
all valves are OK All Valves OK C52 OUT
26
==========
Grant the permissions to the APS FE-EPS
==========
Mirror 1 ion gauge vacuum OK M1 Vac IG1-1 Ok C30
beam line vacuum is OK BL Vac OK Y0 OUT
27
all water flow signals OK all flow OK C20
all vacuum signals OK All Vac Ok C27
all pressure/temperature signals OK All PT OK C40
all valves are OK All Valves OK C52
white beam shutter is permitted to open whit shtr perm Y1 OUT
28


allow the mono shutter to be open if the vacuum on the 33BM-B shutter is good (or the vacuum is pumping down)
33BM-B Be Window vacuum protection mono beam OK 33BMB Vac Prot
X70
29
mono shutter is permitted to open mono shtr perm
Y2
OUT
show that the "white shutter closed" status is received in two places (no need for the reference to X60 other than to get it into the XREF list)
FrontEnd white shutter CLOSED signal from PSS FE whit shtr
X75
remote shutter interface FE white shutter closed RSI FE WS CLOSED
X60
30
white beam shutter closed signal to EPICS wht shut closed
Y3
OUT
remote shutter interface FE white shutter closed RSI FE WS CLOSED
X60
remote shutter interface mono shutter closed RSI MS CLOSED
X61
31
mono beam shutter closed signal to EPICS mono shut closed
Y4
OUT
trigger event log entry when beam line vacuum status changes
beam line vacuum is OK BL Vac OK
Y0
old BL vac OK
C100
32
a new event has been triggered to be logged new event
C0
SET
beam line vacuum is OK BL Vac OK
Y0
old BL vac OK
C100
trigger event log entry when white beam shutter permit status changes
white beam shutter is permitted to open whit shtr perm
Y1
old W shtr perm
C101
33
a new event has been triggered to be logged new event
C0
SET
white beam shutter is permitted to open whit shtr perm
Y1
old W shtr perm
C101
trigger event log entry when mono beam shutter permit status changes
mono shutter is permitted to open mono shtr perm
Y2
old M shtr perm
C102
34
a new event has been triggered to be logged new event
C0
SET
mono shutter is permitted to open mono shtr perm
Y2
old M shtr perm
C102


Did the FE vacuum valve open or close?
FrontEnd vacuum valve CLOSED signal from PSS
FE vac valve
X74
old FEVV status
C104
a new event has been triggered to be logged
new event
C0
SET
35
FrontEnd vacuum valve CLOSED signal from PSS
FE vac valve
X74
old FEVV status
C104
Did the FE white beam shutter open or close?
FrontEnd white shutter CLOSED signal from PSS
FE whit shtr
X75
old FEWS status
C105
a new event has been triggered to be logged
new event
C0
SET
36
FrontEnd white shutter CLOSED signal from PSS
FE whit shtr
X75
old FEWS status
C105
Did the mono beam shutter open or close?
remote shutter interface mono shutter closed
RSI MS CLOSED
X61
old MBS status
C106
a new event has been triggered to be logged
new event
C0
SET
37
remote shutter interface mono shutter closed
RSI MS CLOSED
X61
old MBS status
C106
==========
start updating the event log
==========
a new event has been triggered to be logged
new event
C0
INC
event logging: event number
event number
V3120
38
when the event log counter wraps around,
force it to wrap at an even multiple of 32 (number of entries in event table):
(32*(9999%32)=9984) where 9999%32=312
a new event has been triggered to be logged
new event
C0
event logging: event number
event number
V3120
≥
K9984
LD
K0
OUT
event logging: event number
event number
V3120
39

for the time stamp: 0.01 s clock
a new event has been triggered to be logged
new event
C0
40
LD
V7747
OUT
event logging: clock time, milliseconds
evt ms clock
V3121
for the time stamp: S:M:H (0059 0059 0023)
a new event has been triggered to be logged
new event
C0
41
LD
K3
LDA
O7766
MOV
event logging: clock time, SecondMinuteHour
evt SMH
V3122
for the time stamp: D/M/Y (0031 0012 0099)
a new event has been triggered to be logged
new event
C0
42
LD
K3
LDA
O7772
MOV
event logging: clock time, DayMonthYear
evt DMY
V3125
copy the inputs X00-X77
a new event has been triggered to be logged
new event
C0
43
LD
K4
LDA
O40400
MOV
event logging: X points
evt VX0
V3130


copy the control relays C00-C77
a new event has been triggered to be logged
new event
C0
44
LD
K4
LDA
O40600
MOV
event logging: C points
evt VC0
V3134
copy the outputs Y00-Y17
a new event has been triggered to be logged
new event
C0
45
LD
K1
LDA
O40500
MOV
event logging: Y points
evt VY0
V3140
locate next entry index in event table
32 table entries (V3160 = V3120 % 32)
a new event has been triggered to be logged
new event
C0
46
LD
event logging: event number
event number
V3120
DIV
K32
POP
OUT
event table index
evTab index
V3160

event table structure
each entry takes 24 words
table base address is v4000

word	description
00	event number
01-04	time stamp
05-07	date stamp
10-13	X00-X77 relays
14-17	C00-C77 relays
20	Y00-Y17 relays
21-27	unused

determine the offset address in the event table at which to store this entry
V3161 = V(4000 + 24 * V3160)

47
a new event has been triggered to be logged
new event
C0

LD
event table index
evTab index
V3160

MUL
K24

BIN

OUT
event table pointer
evTab ptr
V3161

add the base address of the event table (V4000)

48
a new event has been triggered to be logged
new event
C0

LDA
O4000

ADDB
event table pointer
evTab ptr
V3161

OUT
event table pointer
evTab ptr
V3161

copy the event entry data into the event table
size of 24 words = 0x18, from V3120 to V3147

49
a new event has been triggered to be logged
new event
C0

LD
K18

LDA
O3120

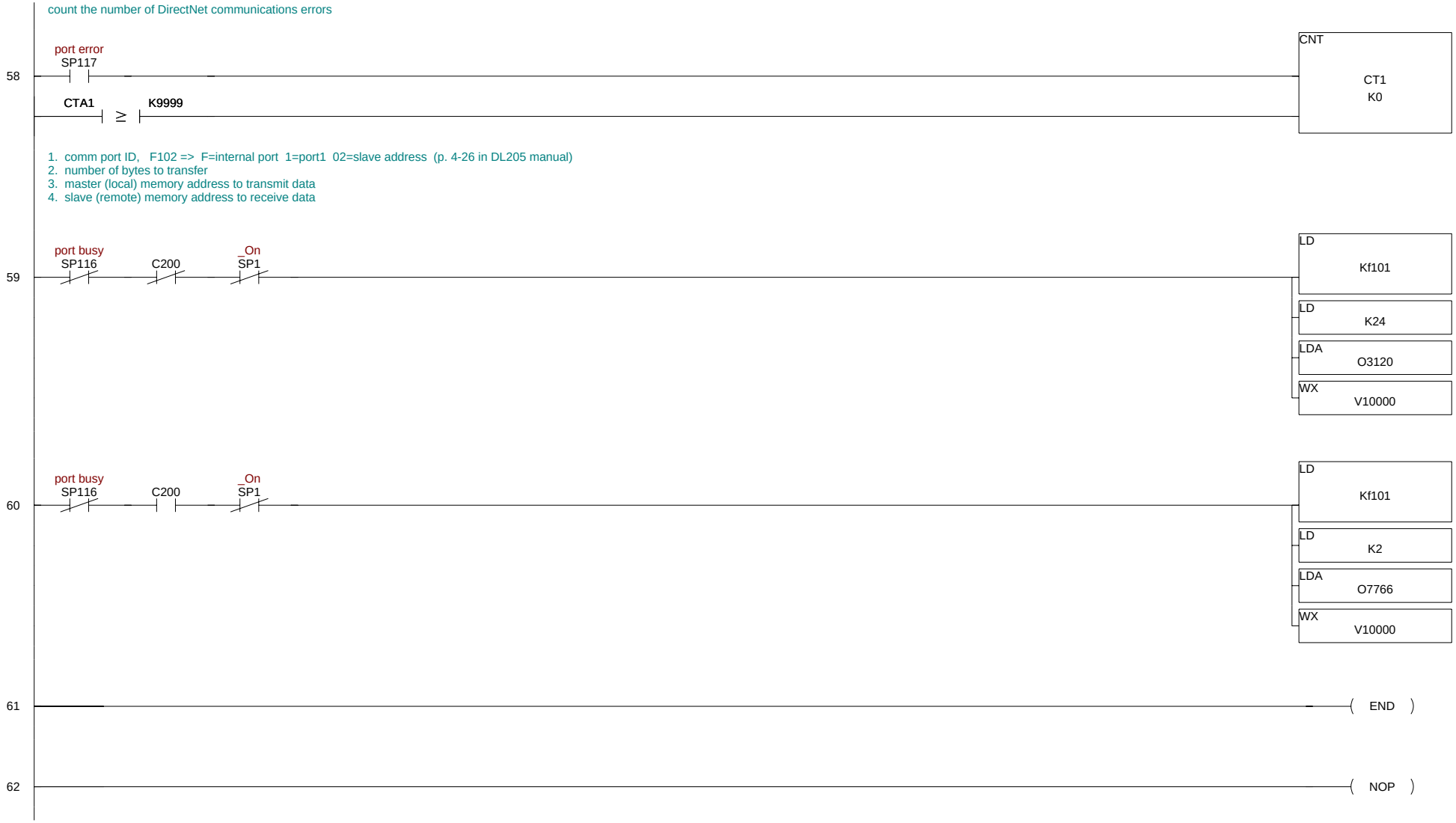
MOV
evTab ptr addr
P3161

save the old value for comparison on the next PLC cycle

50
beam line vacuum is OK
BL Vac OK
Y0

old BL vac OK
C100
OUT

white beam shutter is permitted to open
whit shtr perm
Y1
old W shtr perm
C101
OUT
51
mono shutter is permitted to open
mono shtr perm
Y2
old M shtr perm
C102
OUT
52
FrontEnd vacuum valve CLOSED signal from PSS
FE vac valve
X74
old FEVV status
C104
OUT
53
show that the "white shutter closed" status is received in two places
(no need for the reference to X60 other than to get it into the XREF list)
FrontEnd white shutter CLOSED signal from PSS
FE whit shtr
X75
remote shutter interface
FE white shutter closed
RSI FE WS CLOSED
X60
old FEWS status
C105
OUT
54
remote shutter interface
FE white shutter closed
RSI FE WS CLOSED
X60
remote shutter interface
mono shutter closed
RSI MS CLOSED
X61
old MBS status
C106
OUT
55
done updating the event log
a new event has been triggered to be logged
new event
C0
a new event has been triggered to be logged
new event
C0
RST
56
count the number of DirectNet communications attempts
port busy
SP116
CTA0
≥
K9999
CNT
CT0
K0
57


count the number of DirectNet communications errors
58
port error
SP117
CTA1
≥
K9999
CNT
CT1
K0
1. comm port ID, F102 => F=internal port 1=port1 02=slave address (p. 4-26 in DL205 manual)
2. number of bytes to transfer
3. master (local) memory address to transmit data
4. slave (remote) memory address to receive data
59
port busy
SP116
C200
_On
SP1
LD
Kf101
LD
K24
LDA
O3120
WX
V10000
60
port busy
SP116
C200
_On
SP1
LD
Kf101
LD
K2
LDA
O7766
WX
V10000
61
END
62
NOP